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Marvin E. Rensink
Lawrence Livermore National Laboratory
P.O. Box 808, L-637
Livermore, CA 94551
Phone : (510) 422-9822
Fax : (510) 424-6401
Email Address : rensink@velo.llnl.gov

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Edge Plasma Simulations with Coupled Fluid and Monte Carlo Models

M.E. Rensink, G.D. Porter, T.D. Rognlien
Lawrence Livermore National Laboratory

and

D.P. Coster, R. Schneider
Max-Planck Institute for Plasma Physics, Garching, Germany

and

C.F.F. Karney, D.P. Stotler
Princeton Plasma Physics Laboratory, Princeton, NJ

We simulate tokamak edge plasmas with the multi-fluid plasma code, UEDGE, coupled to a Monte Carlo neutrals code. The plasma and neutrals models are explicitly coupled in the sense that the plasma background from UEDGE is fixed during the Monte Carlo neutrals update and the neutral particle source terms for the plasma density, parallel momentum and thermal energies are fixed (or globally scaled) during the plasma update. The self-consistent plasma-neutrals solution is obtained by sequentially advancing the plasma for one time step and running the neutrals to steady state with the plasma fixed. Our initial test problem simulates an edge plasma with separatrix density 7.0e+19 /m**3 and temperature 150 eV in a slab geometry with a 25 cm long divertor leg. A test run for 30 iterations at a time step of 1.0e-05 sec has been completed. As expected, convergence behavior depends on the size of the time step. Comparisons with earlier work using the B2-EIRENE model will be presented. Options for advancing the neutrals in a time-dependent manner and for implicit coupling algorithms are being explored. Although first runs utilized the EIRENE Monte Carlo neutrals code, the DEGAS2 code is a possible substitute for EIRENE.

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